traced. The horizons are not conspicuous lithologically, and it is not easy to detect them except in a country of good exposures—a feature which is not usually found in areas covered by Kimmeridge Clay.

The lateral extent of these oil-shales is certainly greater than the present evidence will allow us to assert with any definiteness, but they will probably be found to vary in richness when traced along their strike and dip, and, in addition, the unconformably overlying Lower Greensands will have eliminated them in certain areas. But when the technical difficulties in the purification of the oil have been overcome, there is every prospect of an industry of important dimensions springing up in Dorsetshire and West Norfolk, and perhaps being linked up by similar industries in Berkshire, Oxfordshire, etc.

The one great drawback, which is at present prohibitive to the general use of this Kimmeridge shale oil, is the abnormal percentage of sulphur present. This exists in a very stable form, and has baffled the commercial attempts to eliminate it; but there is little doubt that a solution will be found, and it is suggested that it will probably lie in changed methods of retorting. The fact that the shale yields upwards of 60 gallons of oil per ton, more than twice the average yield in Scotland, indicates that when the difficulty of the sulphur content has been overcome it will become an important asset in the economic development of the country. V. C. I.

NOTES.

A BOARD of Fuel Research has been appointed by the Committee of the Privy Council for Scientific and Industrial Research on the recommendation of their Advisory Council. Sir George Beilby will act as director of the new organisation, and be assisted by the Hon. Sir C. Parsons, Mr. R. Threlfall, and Sir R. Redmayne as members of the board. By arrangement with the governors of the Imperial College of Science and Technology, Prof. W. A. Bone will be retained as consultant to the Board of Fuel Research under the Department of Scientific and Industrial Research, continuing to hold his chair at the Imperial College.

SIR ARTHUR LEE has been appointed by the President of the Board of Agriculture Director-General of Food Production; the Hon. E. G. Strutt and Mr. A. D. Hall will, for the period of the war, be additional Agricultural Adviser and Scientific Technical Expert respectively, and the Duke of Marlborough has been appointed Joint Parliamentary Secretary to the Board of Agriculture, representing the department in the House of Lords. All the posts named are unpaid.

THE Board of Trade is taking possession of all the coal mines in the United Kingdom for the period of the war, and a new department is being set up to control the mines and to deal with production, output, distribution, finance, wages, and the price of coal. Mr. Guy Calthrop, general manager of the London and North-Western Railway Company, has been appointed head of the new department, and is designated Controller of Coal Mines. He will be assisted by Sir R. Redmayne, H.M. Chief Inspector of Mines, and an advisory committee consisting of persons selected to represent coal-owners and coal-miners. Mr. Walker, the Deputy Chief Inspector of Mines, will act as Chief Inspector for the period of the war.

SIR BAMFYLDE FULLER has undertaken the charge of the department of the War Office which is dealing with the supply of timber for the use of the Army; the control of the use of timber in the United Kingdom with the view of effecting economy in its use for all purposes; the regulation of the purchase of such timber as may be imported from sources outside the United Kingdom, whether on Government or private account; and the stimulation of the felling of timber in the United Kingdom. Sir B. Fuller will be assisted by an Advisory Committee, composed of timber merchants chosen by the Timber Federation, and by others representing firms of repute which do not belong to the federation. The address of the department is Caxton House, Tothill Street, Westminster.

SIR ROBERT HADFIELD is succeeding the Rt. Hon. H. E. Duke, K.C., M.P., as president of the Society of British Gas Industries.

WE regret to learn of the death, on February 17, at the age of sixty-seven years, of Mr. George Massee, formerly of the Royal Botanic Gardens, Kew.

FROM Königsberg comes the news of the death of Dr. Friedrich Hahn, who occupied the chair of geography at the University there. He was born in 1852, began his academic career at Leipzig in 1879, and went to Königsberg in 1885. Hahn was a great traveller, having visited Australia, Polynesia, and Africa. He was a prolific writer, his principal work being the great collection, "Die landeskundliche Literatur der Provinzen Ost- und Westpreussen." Among his other books may be mentioned "Ueber Aufsteigen und Sinken der Küsten" (1879), "Inselstudien" (1883), "Die Städte der norddeutschen Tiefebene" (1885), and "Topographischer Führer durch Nordwest-Deutschland" (1895).

A MEETING of the Refractory Materials Section of the Ceramic Society will be held at the University, Leeds, on March 13 and 14, when the following papers will be read:—"The Dressler Kiln," Mr. Dressler; "The Spalling of Magnesite Bricks," Dr. J. W. Mellor; "A Process of Manufacturing Heavy Fireclay and Similar Articles," Mr. B. J. Allan; "Geology of Clays of Central Yorkshire," Prof. Kendall and Mr. Gilligan; "The Use of Zirconia as a Refractory Material," Mr. J. A. Audley; and "Temperature Measurements on Clay Works Practice," Prof. Cobb.

MR. A. CHASTON CHAPMAN will deliver a lecture, entitled "Some Main Lines of Advance in the Domain of Modern Analytical Chemistry," to the Chemical Society on March 15, and Dr. Horace T. Brown will lecture on "The Principles of Diffusion: their Analogies and Applications" on May 17. The following changes in the officers and council of the Chemical Society for 1917–18 have been proposed by the council:—*President,* Prof. W. Jackson Pope; *New Vice-Presidents,* Col. A. Smithells and Prof. Sydney Young; *New Ordinary Members of Council,* Prof. H. C. H. Carpenter, Prof. A. Findlay, Prof. A. Harden, and Dr. T. A. Henry.

SIR ALFRED KEOGH, Director-General of the Army Medical Service, presiding at a lecture at the Royal Institute of Public Health on February 14, stated that in France at that moment there were only five cases of enteric fever and eighteen cases of paratyphoid fever, with seventy or eighty doubtful cases. He attributed this result to inoculation, and the general good health of the Army to good food, in addition to careful sanitation. The health of the Army at all our fronts to-day is better than the ordinary health of the Army in peace-time.

THE Amsterdam correspondent of the *Times*, in the issue for February 15, directs attention to the declining birth-rate in Germany. In the week ending December 30 the number of births in Berlin was 376, and in Amsterdam 331, although the population of the former city is only 80,000 short of three times that of Amsterdam. In Leipzig, with a population 50,000 more than that of Amsterdam, the births are less than half those in the latter city. The marriage-rate in Berlin has also been declining, while the death-rate has increased.

IN 1813 Dr. Matthew Baillie and Sir Everard Home, "being desirous of showing a lasting mark of respect to the memory of the late John Hunter," endowed an oration, to be called "the Hunterian oration," now given biennially, on the anniversary of Hunter's birthday, February 13. The orator for the present year, Surgeon-General Sir George H. Makins, took as his subject "The Influence Exerted by the Military Experience of John Hunter on Himself and the Military Surgeon of To-day." In 1760 Hunter went as surgeon on the staff to Belleisle and Portugal, and was on active service for two years. At a later date he recorded his experience in two lectures on "The Treatment of Gunshot Wounds." The orator contrasted the surgical practices there recorded with the methods which surgeons have been led to adopt in the present war, concluding that modern experience had, in the main, justified the principles adopted by the great surgeon. Hunter recognised that there was in every wound a strong natural tendency to heal, and that the surgeon's attitude must be expectant. In the present war, however, experience had justified the operative, not the expectant, treatment of gunshot injuries of the abdomen and of the skull. In concluding, the orator drew an interesting comparison between Hunter and his great successor—Joseph Lister.

FEW races are more influenced by the belief that they are surrounded by numbers of malignant spirits than the people of Korea. To their influence they attribute every ill, all bad luck, official malevolence, loss of power or position, and especially sickness. According to a bulletin of the Smithsonian Institution recently published, these spirits are divided into two classes: demons, self-existent malcontent spirits of departed impoverished people who died in distress; and spirits whose natures are partly kindly, which include the ghosts of prosperous and good people; but even the latter appear to be easily offended and are extraordinarily capricious. To cope with these demons and spirits two classes of sorcerers are employed—fortune-tellers, known as Pansu, and the Mutang, usually a woman, who claims the power of being possessed by, and of controlling, the spirits. Many of the Pansu are blind men, perhaps owing to the common belief among primitive peoples that those who have been deprived of physical sight possess an inner spiritual vision. The paper concludes with a full account of the methods employed by these two classes of officiants.

THE Congress of Archæological Societies issues the report for 1916 of the Committee on Ancient Earthworks and Fortified Enclosures. Vandalism, due to carelessness or ignorance, is always to be feared and must constantly be guarded against. By the vigilance of local archæologists the danger to earthworks and other remains in the neighbourhood of Stonehenge, due to military operations, has been averted. A more serious problem arose regarding the protection of Cannington Park Camp in Somerset, owing to mining operations. "This case," the committee observes, "brings out forcibly a weak point in the Ancient Monuments Consolidation and Amendment Act, viz. that there exists no power to give compensation, or to acquire a site, where the destruction of an earthwork or other ancient monument would be to the pecuniary advantage of its owner or tenant. It remains to be seen how far the Legislature will be willing in such a case to put in force the compulsory power of preservation that now exists."

THE Smithsonian Institution has recently issued a bulletin describing the collection of Sioux songs by Miss Frances Densmore. "The Indians," she writes, "do not keep a regular rhythm throughout a song, but frequently alternate double and triple measures in a way that appears absolutely erratic, yet the song as a whole will have rhythmic completeness: in other words, the rhythm makes sense." Some of the most interesting songs recorded by her have this irregularity of measure-lengths, and she has found, by analysing the structure of about 600 songs, that the melodic form was connected with the idea. This she has followed with a test of the rhythm, by which it has been found that the peculiar alternating of the double and triple measures, into which the songs are divided, expresses the idea of the song. In developing this theory Miss Densmore has been assisted by Signor Alberto Bimboni, an Italian composer and conductor, with whose aid about 1100 Indian songs have been recorded on the specially constructed phonograph which she takes into the field.

ALL who were privileged to claim the friendship of the late Capt. F. C. Selous will applaud the fine appreciation of his achievements as a naturalist and Empire-builder, by Mr. Abel Chapman in *British Birds* for February, than whom none knew, or understood, him better. Mr. Chapman reviews both Selous's work in Africa and his hunting expeditions in various parts of Europe, Asia Minor, and North America, in all of which he added materially not merely to our knowledge of the birds and beasts of the country, but also to its geographical features, a fact which has been generally missed by those who have contributed obituary notices to the Press.

IN our issue of January 11, on p. 376, it was stated that the Bill for the introduction of protective measures designed to save some of the more interesting birds of Malta from extermination had been, at least temporarily, shelved. We are glad to be able to say that in making this announcement our correspondent was mistaken. A letter has just reached us from the Lieutenant-Governor's Office pointing out that the regulations issued in October last by the Government, designed to protect birds against wanton and senseless destruction, are actually in force. What was shelved was a motion for the appointment of a Commission to study and suggest amendments to the regulations. Since the object of the motion was to undo what the Government had done, the defeat of the scheme will cause the greatest satisfaction to all interested in the protection of birds.

THE report of the Department of Fisheries of the Province of Bengal and Bihar and Orissa deals, among other matters, with the scientific investigation of the fishes of these parts of India. The deputy-director, Mr. Southwell, points out that "the real development of the fisheries of the province depends almost wholly upon scientific research." Reference is made to a number of papers giving the results of inspections, statistical inquiries, and investigations into fish parasites and diseases. The fresh-water fishes are of particular importance, and a good deal of work relative to the life-history of the Indian carp and other species has been undertaken and is in progress. Artificial cultivation of the carp has been carried on for some time, and arrangements have been made for the distribution of fry. Considerable difficulty has been experienced with regard to the best practice of obtaining the fertilised eggs of the species cultivated, and these difficulties are the object of investigation. So far, little has been done with regard to the marine and estuarine species of fishes, and there do not appear to be opportunities for the active prosecution of research in this direction. Some attention is being directed to the possibility of developing the fresh-water mussel fisheries by cultural methods. Co-operative work with regard to distribution is also mentioned in the report.

THE ravages produced in the olive crop in Italy by the attacks of the fly *Dacus oleae* caused Dr. F. Silvestri to initiate a series of investigations on the parasites of this insect, with the view of thus checking the destruction. The *Atti dei Lincei*, xxv. (2), 11, contains a preliminary note on the extension of these observations to India. Previously they were undertaken in the Italian colonies of Erythrea and Tripoli, where they resulted in the discovery of the hymenopterous parasite known as *Opius concolor*. The Indian observations were made in conjunction with the Government entomologist, Mr. T. B. Fletcher, and although the first samples yielded no flies, further investigation showed the existence of a fly and a parasite differing from those found in the Italian colonies. The Indian fly is now described by Dr. Silvestri under the name *Dacus oleae*, var. *asiatica*, and differs only in colour from the African form, but the new parasite is considered to be a fresh species, to be called *Opius ponerophagus*, as it possesses morphological differences in the shape of the discoidal and second cubital cells of the wings and elsewhere.

FROM the annual report of the Department of Agriculture, Uganda, for the year ended March 31, 1916, it is interesting to note that the coffee on the plantation has shown a marked improvement. The leaf disease due to the well-known fungus, *Hemileia vastatrix*, which was causing some anxiety, appears to be well in hand owing to the measures taken by the officers of the department. The prevalence of the disease shows marked fluctuations, the commencement of an outbreak coinciding with the beginning of the rains about the end of February, and its termination with the drought. From August, 1915, to February, 1916, there was a long spell of partial immunity.

THE annual report of the Agricultural Department, St. Vincent, for 1915–16 is a record of steady progress. In addition to the usual work, experiments on cotton-breeding are being made at the experiment station, which, if they can be fully carried out, should yield valuable results. Plants possessing resistance to angular spot and boll-rot have been selected, and an effort is being made to breed from them resistant strains. Selection for lint characters is also being undertaken. Should varieties be produced capable of resisting the attacks of the cotton stainer—the main cause of boll trouble—the cotton yield would be nearly doubled. Work of this kind emphasises the great need for the establishment of properly equipped agricultural research stations in the tropics in order that plant-breeding experiments needing many years of careful research may be undertaken without interruption and hindrance.

A USEFUL publication on medicinal plants has been published as Bulletin No. 78 of the West of Scotland Agricultural College. The cultivation, drying, yield, and prices of the various herbs are considered in the opening pages at sufficient length, and particular attention is paid to those suitable for Scotland. This is followed by a list of hardy herbs, trees, and shrubs used in medicine. The list is very well compiled, the botanical and common names and natural family of each plant being given, then its duration—annual, biennial, or perennial—the part used occupies the next column, then the time when it should be collected, and, finally, general information as to its soil requirements, situation, etc. This and Miss Teetgen's recently published book on "Profitable Herb Growing and Collecting" should be studied by those who are interesting themselves in the growing and collecting of medicinal plants.

THE Board of Agriculture and Fisheries has issued an order, dated January 15, which came into force on February 1, with regard to the wart disease of potatoes. It is forbidden to plant potatoes on any land on which potatoes affected with wart disease have been grown during the previous year, unless such planting be duly authorised by the Board or the local authority. A person convicted is liable to a penalty not exceeding 10*l.*, unless he can prove to the satisfaction of the court that he was unaware that affected potatoes had been grown on the land in a previous year.

THE thirtieth annual report of the Liverpool Marine Biology Committee, drawn up by Prof. Herdman, and dealing with the work of the Marine Biological Station at Port Erin for the year 1916, shows that the usual Easter vacation course in marine biology was carried on and was attended by fifteen students, that five research workers have occupied tables, and that in the fish hatchery nearly eight millions of plaice larvæ were hatched and set free. The curator (Mr. Chadwick) records observations on the rapidity with which specimens of the brittle star *Ophiocoma nigra* react to the presence of food; they detected in 15 seconds the presence of a small piece of mussel suspended out of their reach in the water of the table-tank on the bottom of which they were living. Mr. Chadwick has directed attention in previous reports to the obstruction of the pipes supplying the aquarium caused by the growth therein of various invertebrates. In the present report he notes two tube-building Polychætes—a single large specimen of *Sabella pavonia* and a vigorous colony of *Salmacina dysteri*—as the causes of such obstruction, and remarks that, although the colony of Salmacina had grown in the absolute darkness of the interior of the pipe, the worms were deeply tinged with the bright orange-red pigment characteristic of the species. He records the presence on one occasion of hundreds of large specimens of *Aplysia punctata* among seaweeds which thickly strewed the area between tide-marks and had been thrown ashore by a fresh westerly breeze. The report also contains an interesting address (32 pp.), given to the Biological Society of Liverpool by Prof. Herdman, on Sir Wyville Thomson and the *Challenger* expedition.

MANY years ago the late Prof. O. C. Marsh obtained from the Cretaceous rocks of Colorado, U.S.A., the hind foot of a running dinosaur constructed like that of a young struthious bird. He named the reptile accordingly Ornithomimus. A nearly complete skeleton of a closely related new genus, Struthiomimus, has now been received by the American Museum of Natural History from the Cretaceous Belly River Formation of Alberta, Canada, and is described by

Prof. H. F. Osborn in the Museum's *Bulletin* (vol. xxxv., art. xliii., January, 1917). Instead of being a raptorial carnivore, as at first seemed probable, it proves to be one of the strangest and most unexpected of dinosaurs, and represents an entirely new group. The jaws are toothless and must have been sheathed in narrow, horny beaks, much like those of an ostrich; but the quadrate and other bones of the skull preserved are distinctly dinosaurian. Compared with the trunk, the head is remarkably small, for although the skull is only one-third longer than that of an ordinary ostrich, it is attached to a backbone more than 13 ft. in length. The long and powerful neck must have been as flexible as in a bird. The small fore limb is long and slender, with three clawed fingers closely pressed together and of nearly equal length. On the whole, it suggests functions like those of the fore-limb of a sloth. The reptile could obviously run rapidly on its three-toed hind-limbs, with the raised forequarters balanced by the long tail. Its habits are very difficult to determine, but Prof. Osborn thinks that it lived much like an ostrich, on a mixed diet, with little power of grasping living or actively moving prey. This conclusion is interesting, for Struthiomimus and Ornithomimus bear many close resemblances to the typical carnivorous dinosaurs, with which they must have had a common ancestry.

A "CATALOGUE of the Collection of Meteorites" in the Field Museum of Natural History at Chicago is given by the curator, Dr. O. C. Farrington, in Publication 188 of that museum (Chicago, 1916, Geol. Ser., vol. iii., pp. 231–312). It is interesting to recall that two other catalogues of meteorite collections, namely, those at Washington and Calcutta, were also published during the latter part of last year. The Chicago collection was greatly augmented in 1912 by the purchase of the famous Ward-Coonley collection, which had already absorbed the large private collections of Mr. J. R. Gregory, of London, and of Count Simashko, of Petrograd; and since the last catalogue of 1903 it has been almost trebled in size. Containing representatives of 657 falls and a total weight of 7566 kilograms (about 7½ tons) of meteoritic material, it now ranks as the foremost collection in the world. The present catalogue gives particulars of the individual specimens, arranged alphabetically under the geographical names of the falls. A few general notes pointing out prominent features of the collection are also given. The largest mass is the Quinn Cañon (Nevada) iron of 1450 kg. The Cañon Diablo (Arizona) iron is represented by 122 individuals, the largest weighing 460 kg., and the total weight being 2306 kg. The Forest City (Iowa) shower of stones is represented by 722 complete individuals, ranging in weight from 3 to 4308 grams. There are some inconsistencies in the transliteration of Russian geographical names, Germanised forms of which seem difficult to eliminate. For example, Government Saratov appears correctly on p. 295, but on p. 288 as Saratowsk, the latter being the German rendering of the Russian adjectival form.

THE Paris correspondent of the *Times,* in the issue for February 10, describes what France has achieved in "war chemistry." Before the war France obtained her coal-tar products—benzene, toluene, xylene, naphthalene, anthracene, phenol, etc.—from Germany, and there was only one factory in the country capable of producing certain colouring matters. Since the latter and explosives have the same starting point, viz. the nitration of hydrocarbons, the position was extremely grave. As quickly as possible nitration plant was laid down in many new works, both private and belonging to the State, arrangements were made for the supply of enormous quantities of benzene and toluene, and shells were soon being manufactured in ever-increasing numbers. France's position as regards sulphuric acid will be excellent; in fact, there may be a difficulty in utilising all that produced. From the product of the phosphate mines of Tunisia and Algeria, together with the superabundant sulphuric acid, it will be possible to supply French farmers with cheap superphosphate, and also to compete in the foreign markets. The Germans probably knew, when in May, 1915, they first made use of asphyxiating gases as a weapon of war, that liquid chlorine was not produced in France. But within a year several works had commenced liquefying the gas. After the war these works will be established, and can be employed for the manufacture of bleaching powder, certain colouring matters, and various pharmaceutical products which France has hitherto had to import.

AN article appears in the *Quarterly Review* for January, under the title "Aircraft Politics in War Time," which gives an exceedingly clear account of the causes and results of the attack on Government-designed aeroplanes which was started by Mr. Pemberton Billing in July, 1916. The writer traces the real cause of this attack to the position in which manufacturers were placed by the rapid changes in the type of machines required. These changes were directly consequent upon the experimental work done at the Royal Aircraft Factory and at the National Physical Laboratory, and prevented the "trade" from making arrangements for repetition work in quantity, thus reducing efficiency from the commercial point of view. The article in question gives strong support to the excellence of the machines designed at the R.A.F., and quotes the case of the "Fokker" to show how easily wrong conclusions as to a machine's performance can be drawn in a moment of excitement. The "Fokker," when captured and tested by our own men, proved inferior to our own machines of similar type in all particulars, and was found to be thoroughly unstable. This is not surprising, since it is well known that the question of aeroplane stability was not understood in Germany as it was in this country at the time war broke out. The progress that has been made since the war started, in regard both to stability and to general aerodynamics, has been truly astonishing, and this scientific progress has had much to do with the altered relations between the "trade" and the Government designers which now exist. Far from discrediting experimental work in aeronautics in favour of the "rule of thumb" method, the private firms are now only too eager to obtain the results of such research and to use them to the utmost in their new designs. The article devotes a considerable amount of space to the purely commercial relations between the private manufacturer and the Government, but it is, nevertheless, well worth reading by those interested in the scientific development of aeronautics.

OUR ASTRONOMICAL COLUMN.

THE SPECTRA OF CEPHEID VARIABLES.—The detailed results of an extensive series of spectroscopic observations of twenty Cepheid variables have been published by Dr. Shapley (*Astrophysical Journal,* xliv., 273). The data indicate that regular changes in spectral type accompany the periodic variations in light, and constitute one of the general and fundamental properties of variable stars of this class. It is somewhat disconcerting to read that, in spite of the great number of observations of the magnitudes of such stars, no really precise information as to maximum magnitude and range of variation is yet available. The data,